



## **A DOE SUCCESS: Underwater Environmental Restoration Activities at Kerr Hollow Quarry**

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**The Project:** The Kerr Hollow Quarry, located on the Oak Ridge Reservation near the Y-12 facility, provided crushed limestone for the Manhattan Project in the 1940's. Operations at the 3-acre, 55-foot deep quarry were stopped in the 1950's and the quarry was allowed to fill with water. It was then used until the mid-1980's as a site for the disposal of a various items including chemically hazardous materials. Known hazardous materials in the quarry included full barrels of un-reacted alkali metals and other hazardous materials. In the early 1990's a project was initiated to remove items from the quarry. Because of the hazards involved, all work had to be performed remotely.

The first step in the remediation project was a survey of the quarry to identify the number and types of items that were present. The survey, performed remotely using a small submersible equipped with a manipulator arm, TV cameras, and lights, indicated the presence of approximately 2,500 items on the bottom of the quarry. The location of each item was recorded. The remediation effort consisted of using a remotely operated pontoon barge, shown above, equipped with a crane and a heavy lift grapple, working in conjunction with the submersible, to lift items from the bottom of the quarry and place them in an underwater shredder. Chips from the shredder were collected in large containers and brought on shore for examination and subsequent placement in waste containers. Large structures, too heavy for the grapple to lift, were examined underwater and if the structures contained a

closed vessel (i.e., a tank), underwater explosives, installed using the submersible, were used to penetrate the vessel to ensure contact with the water. The inside of the vessel was then remotely examined using a small TV camera. The control station for all remotely operated equipment was located in a trailer several hundred meters from the quarry.

The remediation effort required approximately three years to complete. During that time more than 19,000 items, weighing more than 100 metric tons, were removed from the quarry. The last step in this effort was a final survey of the quarry to ensure that all items had been removed or that no closed vessels remained.

**The Impact:** It is believed the cleanup of this quarry was the first totally remote underwater remediation performed in the country. A commercial sub-contractor, experienced in off-shore oil platform construction and maintenance, was used to provide expertise in underwater operations and to provide equipment which was modified for operations in the quarry. A rather large number of other quarries, lakes, holding ponds, containing chemically hazardous or radioactively contaminated materials, are located at DOE sites across the U.S. The approach used in the Kerr Hollow Quarry remediation, along with identified technology improvements, could be used to remediate these sites.

**Further Advances through a RIM Initiative:** The approach described above for underwater remediation identified several technological improvements that would greatly improve the efficiency of the work. For example, better methods to inventory the contents of an underwater site would greatly improve system

performance. As noted above, an initial “visual” survey identified 2,500 items, but over 19,000 were eventually removed. Turbidity in the water made viewing extremely difficult at distances greater than 24-30 inches. Better methods of viewing or object identification would have significantly improved the efficiency of operations. Automated navigational techniques would have reduced the significant time that was spent in returning to a particular underwater location to recover an object detected previously. The RIM initiative can contribute to much improved productivity with advanced sensors, mapping, and autonomous operations for future underwater cleanup operations.



Kerr Hollow Quarry

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